

## CLAIMS

We claim:

1           1.     A DSL modem comprising:  
2                 a bandwidth allocator adapted to dynamically adjust a bandwidth allocation based  
3                     on voice channel demand, the bandwidth allocation defining a bandwidth  
4                     for each of one or more voice channels and unchannelized data; and  
5                 a formatter coupled to the bandwidth allocator, the formatter adapted to combine  
6                     the voice channels and unchannelized data onto a digital subscriber line  
7                     according to the bandwidth allocation, thereby creating a transmission  
8                     signal.

1           2.     The DSL modem of claim 1, further comprising:  
2                 an off-hook detector coupled to the bandwidth allocator, the off-hook detector  
3                     adapted to couple to one or more local customer premises voice lines for  
4                     measuring voice channel demand thereon.

1           3.     The DSL modem of claim 2, further comprising:  
2                 a next-format storage coupled to the off-hook detector for storing a next  
3                     bandwidth allocation, the next bandwidth allocation based on a detected  
4                     change in voice channel demand.

1           4.     The DSL modem of claim 1, wherein the transmission signal includes next  
2                 bandwidth allocation data, the next bandwidth allocation data defining an anticipated  
3                 bandwidth for the voice channels and data.

1           5.     The DSL modem of claim 1, wherein the bandwidth for each voice channel is  
2                 associated with a timeslot in the transmission signal, the remaining transmission signal  
3                 bandwidth available for data.

1           6.     The DSL modem of claim 5, wherein the bandwidth allocator is adapted to  
2     adjust the bandwidth allocation at integer multiples of the periodicity of the timeslots.

1           7.     The DSL modem of claim 1, wherein the formatter is adapted to format the  
2     transmission signal into a series of superframes, each superframe including a plurality of  
3     network frames, each network frame including a plurality of low-level frames, each low-level  
4     frame including a plurality of timeslots, the timeslots containing a voice call or data.

1           8.     The DSL modem of claim 7, wherein the bandwidth allocator is adapted to  
2     adjust the bandwidth allocation at the frequency of the superframe.

1           9.     The DSL modem of claim 7, wherein the network frames are synchronized to  
2     a telephone-network timing reference.

1           10.    The DSL modem of claim 1, wherein at least one voice channel includes voice  
2     data selected from the group consisting of: voice data, facsimile data, analog modem data,  
3     and digital service data.

1           11.    The DSL modem of claim 1, wherein the DSL modem is a central office  
2     modem.

1           12.    A DSL modem comprising:  
2           a DSL connection for transmitting information over a digital subscriber line;  
3           a module coupled to the DSL connection for transmitting channelized data and  
4           unchannelized data over the digital subscriber line, the module adapted to  
5           dynamically allocate bandwidth for transmitting the channelized data  
6           based on availability of channelized data, and to dynamically reallocate  
7           unused channelized data bandwidth for transmitting the unchannelized  
8           data.

1           13.    A method of dynamically allocating bandwidth in a digital subscriber line  
2 among channelized data from one or more local phone lines and unchannelized data, the  
3 method comprising:

4                establishing a connection to a digital subscriber line;  
5                allocating a portion of the bandwidth for each of the local phone lines in use, the  
6                    remaining bandwidth available for unchannelized data;  
7                transmitting the channelized and unchannelized data over the digital subscriber  
8                    line in their respective allocated bandwidths;  
9                detecting a change in phone line usage; and  
10               reallocating the bandwidths among the local phone lines and unchannelized data  
11                   based on the detected change.

1           14.    The method of claim 13, further comprising:  
2                transmitting a bandwidth allocation over the digital subscriber line, the bandwidth  
3                    allocation defining bandwidths corresponding to the channelized and  
4                    unchannelized data.

1           15.    The method of claim 13, wherein the bandwidths allocated for each of the  
2 local phone lines in use are substantially equal and are capable of carrying a voice call.

1           16.    A method of transmitting voice calls and digital data over a digital subscriber  
2 line, the method comprising:

3                transmitting digital data over the digital subscriber line in a bandwidth;  
4                detecting a new voice call;  
5                responsive to the new voice call, dynamically reallocating a first portion of the  
6                    bandwidth to the voice call and a second portion of the bandwidth to the  
7                    digital data; and  
8                combining the voice call in the first portion of the bandwidth and the digital data  
9                    in the second portion of the bandwidth for transmitting over the digital  
10               subscriber line.

1           17.    The method of claim 16, wherein the first portion of the bandwidth is outside  
2 POTS band frequencies.

1           18.    The method of claim 16, wherein the voice call includes data selected from  
2 the group consisting of: voice data, facsimile data, analog modem data, and digital service  
3 data.

1           19.    The method of claim 16, further comprising:  
2                responsive to the voice call's ending, reallocating the first portion of the  
3                bandwidth to the digital data.

1           20.    A method of dynamically allocating bandwidth among voice and data traffic,  
2 the bandwidth comprising a plurality of timeslots, the method comprising:  
3                allocating timeslots among the voice and data traffic;  
4                composing a first superframe, the first superframe containing a plurality of  
5                network frames, each network frame containing a plurality of low-level  
6                frames, each low-level frame containing the voice and data traffic in their  
7                allocated timeslots;  
8                sending the first superframe over a digital subscriber line;  
9                in response to detecting a change in the voice traffic demand, reallocating the  
10              timeslots among the voice and data traffic;  
11              composing a second superframe, the second superframe containing a plurality of  
12              network frames, each network frame containing a plurality of low-level  
13              frames, each low-level frame containing the voice and data traffic in their  
14              reallocated timeslots; and  
15              sending the second superframe over the digital subscriber line.

1           21.    The method of claim 20, wherein composing the first superframe includes  
2 synchronizing the network frames to a telephone-network timing reference.

- 1        22.    The method of claim 20, further comprising:  
2            sending a next allocation of the timeslots over the digital subscriber line to the  
3            remote modem, the next allocation being encoded within the current  
4            superframe.

For reference